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ABSTRACT

This booklet provides introductory information and terminology for art teachers concerning the use of microccmputers in elementary and secondary school art classes. Part 1 describes the sizes and uses of microcomputers and distinguishes between maxi, mini, micro, lap, and handheld computers. Part 2 discusses: (1) basic microcomputer hardware and peripheral equipment, such as keyboards, monitors, disk drives, printers, plotters, and modems; and (2) how to create images through use of a mouse, touchpads and graphics' tablets, joysticks, paddles, lite pens, scanners, clip art, and voice activation and how to retrieve various images from the computer. Part 3 explains basic procedures for classroom care of microcomputers and describes floppy disks, while part 4 discusses microcomputer art software packages for specific elementary and secondary grade levels and provides purchasing information. Part 5 suggests microcomputer training possibilities for art teachers. (JHP)

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AN INTRODUCTORY VOCABULARY FOR ART TEACHERS WHO NEED TO MAKE SENSE OF THE NEW TECHNOLOGY

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MICROCOMPUTERS IN ART EDUCATION

by

Ginny Prouch

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PROLOGUE

Ten years ago, the quality of art production possible on microcomputers left much to be desired. Arts software simply did not exist.

Five years ago, conditions were improving, but the software wasn't as good as it is today.

During the last five years, one company after another has been producing quality software to fit and work with increasingly more powerful and capable microcomputers. Two recent hardware improvements, the AMIGA and the Apple IIGS, have revolutionized the color graphics potential for home and school art learning.

Acquiring color monitors, ink jet color printers, laser printers, graphic software packages, cables for connecting it all together, second disk drives, and the like, presents new challenges for art teachers who seek to employ contemporary technology to enrich opportunities for their students. Fortunately, many other teachers are not using equipment already in our schools. With a little work, these computers can be put into art programs with the blessings of administration.

With this in mind, this document was designed to acquaint interested readers with a beginning vocabulary of microcomputer technology and to present some information

and insights regarding the selection and use of microcomputers, peripherals, and software for art education. Costs are current as of Winter, 1988, as is the availability of specified hardware and software items. It is hoped that this introductory document will be followed by another that treats hardware and software more specifically, and by still another that relates all of this information to real-life classroom curriculum.

Ginny Brouch
Phoenix, Arizona 1988

SIZES AND USES:

Maxi, mini, micro, lap and handheld

More than fifty years have gone into the development of the mainframe or "maxi" computers. These are the marvelous giants of technology that help us in our exploration of space as well as in a large number of socio-economic daily adventures. Price tags go from several hundred thousand dollars each into the millions.

For humans and enterprises with smaller needs, a version was developed to cope with less monumental situations. Now known as minicomputers, these tools range in price from $15,000 to $200,000. Among other things, they help us to produce animation sequences in films such as TRON and STAR WARS. They also help with school district budgets, scheduling, and many of our daily, social complexities.

A little over ten years ago, in the ever-present battle to increase power and ability while reducing size and awkwardness, some clever humans invented the microcomputer for those of us who wanted to have one of our very own to take home with us. These computers became known as "PC's", or personal computers. They were designed and produced for individuals and small businesses. Over the years, these microcomputers have become increasingly sophisticated and powerful. They permit entertainment (games of all sorts and kinds), educational assistance

(how to do your own taxes, how to spell, how to install and repair, etc.), small business aids (database filing systems, spreadsheet accounting and word processing) and, last but not least, graphics production in the form and shape of charts, graphs, drawings, illustrations, and animation.

Microcomputer price tags are comparatively micro also, ranging from startup (extremely basic) costs of around $100 to fully equipped, super-sophisticated, desktop publishing outfits for around $10,000.

Many of our schools have been investing in microcomputers for quite a few years, mostly for math and science adventures or business applications. As a result, we have all manner of size, shape, and configuration already available in many of our schools. Some are in computer labs, some in offices, some in classrooms, some in closets.

Increasingly, art teachers have become interested in microcomputers and are developing curriculum to permit learners the experience of producing art using computers. As with the "art cart" of yesteryear (and today), there are computer artmobiles capable of moving from school to school or district to district on a shared basis. Linked with interactive videotape and/or compact optical laser disks, the potentials for art instruction have consistently compounded. Art history, criticism, aesthetics and production have become technologically viable.

Newest on the block are "lap" computers. These portable, battery-operated, or plug-in, briefcase-sized dynamos can travel with the busy executive or rest gently on the lap or desk of a young student. While prices are still closer to microcomputer prices, they are swiftly coming down as popularity and utility increase.

Some of us remember the bulky calculators and adding machines of several decades ago. We lived through the miniaturization and cost reductions that frequently took place during the sixties and early seventies. Today, some of us carry a credit card-sized calculator in our pocket, purse or checkbook. It doesn't take a quantum leap of imagination to see the hand held computer of tomorrow.

The CPU: Where drawings are translated to the computer screen

A computer begins with a container with space for the transistors and connections that comprise the Central Processing Unit (CPU). This is "the brain" or "memory" of the computer as well as its operating base. Often it is attached to a keyboard, causing the entire unit to resemble the familiar typewriter.

The CPU for a microcomputer comes in a size which is described in "K's" (thousands). A 64K CPU, for example, refers to the capacity of the computer to work within the parameters of 65,635 bytes of memory. Each byte contains 256 different memory codes which are controlled by 8 "bits". Think of a "bit" as an electronic switch that is either on or off.

A computer basically works by having switches on or off. Which switches are on or off at any given time comprise a code which is electronically activated, received, recorded, erased, and/or deactivated, depending on the commands (programs) of humans. Codes translate into dots which become letters, words, and numbers, as well as dots which become lines and images. These dots (square or rectangular in shape) are called PIXELS in the computer industry. They are also called pixels in computer art.

Most people have difficulty trying to visualize or conceptualize the inner workings of a CPU. It is even more difficult to try to cope with the speed with which the switching events electronically take place. Fortunately, it is not important to be able to do so. It is only necessary to accept the fact that this takes place and that it permits many things to happen more quickly than ever before, including the making of mistakes.

Another name for the CPU is the "motherboard". The basic motherboard of many microcomputers began as a 4K and grew to an 8K, 16K, 32K, 48K, and then a 64K. By buying and inserting special "cards" (more transistors and connections on portable units shaped somewhat like playing cards), some internal memories can be increased in size. Insertion of an 80-column card on a 64K motherboard, for example, permits 128K (131,072 bytes) of power and capacity.

Recently, microcomputers have been manufactured with more and more K-power and you can read of 256's, 512's, 640's, etc. Another "add-on" available currently is a gadget known as a hard disk. These increase capacity not only by K's but also by M's. M's stand for megabytes (1 megabyte [MB] = 1,000K). Hard disks are already appearing on the market in multiples of 20MB sizes. Gigabytes (GB: 1,000 megabytes) are already a reality. Each advancement increases power and capacity.

Why do you need to know this?

If you wish to produce art on microcomputers, you need space to work. If you write your own programs, you can do a lot of work with a 48K or 64K computer, but designs and animations will tend to be quite simplistic. Aesthetic quality is possible

within these working parameters, but the grass is much greener (or purple or red or even multi-colored. . .) and more exciting over and beyond a fence or two as more K's are added.

If you use software packages (programming already done by people who love to do that), most new packages (1985 to present) require a basic capability of 128K. A single composition (picture) may take between 13K and 33K worth of working and storage space. As K-power increases, so does the sophistication of the work you can produce. A computer with 512K permits use of software that allows smoother lines and better color resolution than that which is available for 128K.

When you invest in software, you have to be able to order it to fit the capabilities of your equipment, because basic hardware differs from manufacturer to manufacturer. Software companies may produce many variations of their programs, or they may produce for one brand of computer but not another. Buyer be alert!!! It is extremely important to know your computer and its capabilities so that you can match software to it.

Odds and ends

The CPU has several other little quirks to confuse beginners: ROM, RAM, DOS, PORTS, and CABLES.

ROM refers to Read Only Memory. In any DOS system (DOS refers to Disk Operated System), a computer, as it is turned on, activates the ROM that is stored internally on a computer chip and searches for a disk (as in floppy disk) in a disk drive to gather instructions and/or language for further

operation. If a readable disk is in the disk drive, the computer "loads" the information and does what the program instructs.

RAM is the abbreviation for "random-access memory", a term generally used to refer to the amount of actual working space a CPU has for dealing with new data that is introduced to be manipulated arithmetically.

DOS (Disk Operating System) refers to any computer using disks for startup and/or the input of information. Computer manufacturers use different operating system languages. Some use DOS 3.3, some use MS-DOS, PC-DOS, or PRO-DOS. **Different software is set up to work on different language systems.**

Some systems are compatible with others; some are not. Software programs that run on Apple computers do not automatically run on IBM computers. There are "accessories" that convert some kinds of data from one kind of DOS to another, but these are add-ons that can increase the cost of units. Some schools have access to mainframes or minicomputers and can "upload" from one microcomputer disk operating system to the larger computer, then "download" into the other DOS micro. Consider this "advanced" and "rare". . . as in very rare.

PORTS. The CPU has side, front, or back openings where other things can be "plugged" into the motherboard. By means of CABLES (special wires and plugs), ports are used to connect the monitor, disk drives, printers, keyboards, modems, etc., many of which may also have cards that will be inserted into slots in the motherboard. It is critically important that cables and ports match (are properly configured).

Peripherals and add-ons

Keyboards, Monitors, Disk Drives, Printers, Plotters and Modems.

If you are trying to purchase new equipment or to assemble parts of this and parts of that from around your school or district, a major word that should go into your vocabulary and be used often is: **CONFIGURATION.**

Why do you need to know this?

The way in which a computer CPU and its component parts (peripherals and add-ons) work together depend upon the system being properly **configured**. Simply put: each part must compatibly work with each other part. If you attach a non-compatible printer (or even a wrong printer card) to your computer, the printer simply will not work. Each peripheral and accessory must be the correct kind to work with the CPU.

Dealers are quite knowledgeable, but they are not perfect. As early as possible, develop a network of humans who will serve as important resources. Form a specialty club of computerized art teachers in your area, community, or state to share expertise. (Begin with members of your professional art education association.) Through various publications on computers (general or specific brands), locate computer club members in your area. Use the manufacturer's hotline or service line for users for answers to operating problems. Search the literature (instructional manual, periodicals, numerous books written on most computers currently available) and/or check with others who use similar equipment (in and outside of your district) to verify that the configuration is correct.

Once you are appropriately impressed with

the concept of configuration, add the accessories desired.

KEYBOARDS: An obvious choice (and often a feature already "built-in" on most computers) would be the typewriter-like keyboard. This may be as simple as our primary level typewriter, or more complex with the addition of a numeric keypad (similar to a pocket calculator and generally for right-handers), and/or control buttons for special "shorthand" commands to the computer (sometimes an extra row of buttons or keys across the top and/or on the sides of the "normal" typewriter keys).

MONITORS: In order to see what you are doing, you need a monitor. Some people use home, black and white, or color TV sets, but most people invest in at least a monochrome monitor. Monochromes come in green and black, black and white, etc., and are very good for most word processing and business accounting work. Much art production, history, criticism, and aesthetics can be taught using monochrome monitors. The availability of RGB monitors brings color to the learning experience. (RGB stands for RedGreenBlue, the physics components for producing color through light rather than pigment.)

Monochrome monitors are available for $200 and less in most instances. Color monitors range from $395 upwards. Units vary considerably in quality and some color monitors do not permit clear monochrome viewing. Some computers come only in monochrome: (Macintosh 512K, Mac+, SE); some only with color (AMIGA, APPLE IIGS).

An AB box or toggle switch can be used to connect a monochrome and a color monitor to a single CPU. By flipping the switch, the

user selects which screen to use for the work to be done. Some computers permit original or later purchase of either or both the monochrome or color monitor.

Monitors are also talked about in terms of pixels; i.e., the number of dots that comprise the screen. These are described in numbers (columns x rows). The higher the numbers, the finer the resolution (quality of drawing).

IBM and compatibles use other codes for color monitors — CGA: (Color Graphics Adaptor) has a resolution of 640 x 200 pixels and comes with earlier models of the computer. EGA: (Enhanced Graphics Adaptor) has a higher resolution (640 x 350), resulting in clearer text and graphics.

DISK DRIVES: Microcomputers usually come with one disk drive for reading floppy disks. Many software programs are facilitated, however, by the use of a second disk drive. If a program is complex or the memory (K's) is small, a person with only one disk drive can spend a lot of time switching between two program disks or a program disk and a save/load disk. This can be both frustrating and discouraging.

In art, lack of a second disk drive can be detrimental to the experience when it interferes with creativity. If only one computer is available to the art teacher, it should definitely have two disk drives for optimum use. If there are 24 computers available for art instruction, a good rule of thumb might be to have 1/8th of those with two disk drives. At the middle school and/or secondary level, if much animation is included in a curriculum, as many as 1/2 of the computers would benefit from a second drive.

PRINTERS: There are five major categories for printers: daisywheel, dot matrix, thermal transfer, ink jet, and laser. They come in black and white, **or** color, or black and white **and** color. Printers utilize ink ribbons for impact related printing (daisywheel and dot matrix).

Ink jet printers are compression printers, wherein small dots of black, blue, yellow, and red are mixed as they are force-sprayed onto chemically-treated paper to provide full spectrum color production. Laser printers and thermal transfer printers work in a fashion similar to copiers wherein images are electronically heat-transferred from a drum to a paper surface.

Some printers require special, chemically-treated papers, while others use readily available and inexpensive paper. Some can only print single sheets while others use continuous form feed or rolls.

Printers range in price from $100 for very basic ink ribbon printers to around $10,000 for top of the line laser printers. Current average prices on the laser printers are between $3,500 and $5,500 and coming down.

Interestingly, there are some high quality color ribbon printers for under $500. Most schools that have printers, however, tend only to have black and white printers for business use. In these situations, art teachers may investigate various kits available for using color ribbons on black and white printers.

The best news is that a computer lab with a few printers can serve many student needs. Also, through the toggling process, several

computers can be wired to the same printer. Although only one computer is sending print instructions at a time, many computers can share one printer through direct connection. The known classroom record, so far, is in Oregon where fifteen computers are networked (linked or toggled) to five printers.

Again, an important word is **configure.** While no single printer solves all art needs, some are more compatible than others with a wider range of computer brands. An informed dealer can be of great assistance here.

PLOTTERS: Another means of obtaining hardcopy of illustrations is the plotter. Generally plotters come with one to a dozen or so colored pens. The computer is programmed to have an arm select a pen from storage, move the pen onto the paper surface and draw lines following coordinates specified by the design created by the artist.

Business and presentation graphics might employ plotters. Many mechanical drawings (automotive, aeronautical, architectural, etc.) require the precision and detail a plotter can render. Plotters come in various sizes to produce hardcopy from relatively small sizes of drawings to blueprint specifications.

MODEMS: By interfacing the computer with a telephone, the user can tap into a wide range of resources and can communicate with many others around the planet. Data can be transmitted, shared, updated, and returned through the use of the modem. Networking potentials are greatly increased. Benefits for art teachers would include the sharing of lesson plans, evaluation instruments, software, and works of art through individual and/or group teleconferencing.

Because this process is costly, it is not as high on most priority lists as other peripherals. Keep a space in your brain for tomorrow's needs, however, and remember this when opportunities arise.

Creating Images

Input tools

Although information can be entered through use of the keyboard or read into the computer from a floppy disk, several other methods exist for not only entering, but also manipulating computer images. These include **the mouse, touchpads and graphics tablets, joystick or paddles, lite pens, scanners, voice activation and click-art.**

Some computers have only one means of input while others have several options all connected simultaneously (e.g., keyboard, touchpad, mouse). In some situations, one tool can be disconnected to permit use of another (e.g., remove touchpad and add joystick).

A MOUSE is a hand-held, generally plastic gadget about the size of a deck of playing cards. It has a ball bearing on the bottom which, when moved about on the surface of a desk, sends electronic signals through the mouse to the computer. The signals are reflected by movement of a "cursor" on the monitor screen. There may be one, two, or three buttons on the top surface of the mouse and, as these are pressed (clicked), certain instructions are given to the computer.

Moving the cursor to a menu of choices for work permits "selection" (by clicking) of an activity. Subsequently, images can be drawn

through a series of clicks and movements, choices and executions. Although it takes a little practice at first, the mouse quickly becomes a very sensitive tool for drawing.

TOUCHPADS AND GRAPHICS TABLETS are similar to that old-fashioned school slate of years ago. Using a stylus (dull-pointed tool that does not make marks on the tablet) the artist sends electronic signals to the computer. These signals are reflected by the monitor's screen cursor, which moves as directed by the stylus moves on the tablet surface, for menu selection and image creation. Buttons are pushed to select from a menu and/or to draw. Recent developments have produced several upgrades of the tablet concept that significantly improve this option.

The JOYSTICK takes its name from the piloting of an aircraft. Similar to the pilot's control, a joystick is generally a short, plastic pole poking up from the center top of a box. As you move the stick forward or back, or side to side, the cursor on the monitor screen reflects the movement. As with the mouse, buttons on the top of the control box assist in making selections from a menu and for operating the stick to create images. Less frequently seen on the current market:

PADDLES operate in almost identical fashion. In early microcomputer development, both joysticks and paddles were mainly produced for use with games.

The LITE PEN is a drawing tool shaped much like a pencil flashlight with a wire extending from the back end into one of the computer ports. With this tool, an individual "draws" directly onto the monitor screen which re-

ceives the information and shows the lines, images, etc., as they are being drawn.

SCANNERS may be attached to the printer, generally in place of the ribbon cartridge. In a process reversing what a printer normally does, they "read" from "copy" (text and/or images) inserted into the printer carriage. This information appears on the computer screen.

Another type of scanner is similar to the surveillance cameras used in banks and stores, or to the increasingly familiar VCR camera. Wired directly into the computer port, this type of scanner sends image signals directly to the computer screen where the images desired can be manipulated by the artist.

A third type of scanner uses the same process as our very familiar copy machines. A page of information is fed into one area of the machine and, instead of a paper duplicate coming out the other side, the images appear on the computer screen.

Current innovations are presenting us with vastly improved scanners and much more progress should occur over the next 1-3 years.

CLIP ART has been with us for a long time. These generic images are widely used in commercial/graphic art production in both the hardcopy magazine or loose sheet forms and, more recently, in the floppy disk "CLICK ART" forms. Consisting of texts, fonts, shapes, and forms of all manner of image, computer users can purchase "shape tables", "graphics libraries" or "collections", or "CLICK ART" disks. Pre-drawn forms can then be loaded into the computer and appear on the screen.

SCANNERS AND CLIP ART each provide the computer artist with prepared forms that can be manipulated through use of software and changed to fit the end goals and overall composition requirements. Through these processes, students *copy* work (their own or that of others) into the computer.

VOICE ACTIVATION is another way of making the computer work. Although this author knows of no applications for art instruction currently utilizing this strategy, if it exists as potential, it is only a matter of time until art applications exist or, if already here, the knowledge becomes more widespread.

Getting Images Out of the Comptuer

Images can be saved to floppy disks for later retrieval and use. They cannot be viewed on the floppy disk, however. In order to see them, they must again be loaded into the computer and called to the screen.

In addition to the hardcopies available through printing or plotting, cameras can be used to prepare stills, slides, and/or motion films. Videotapes are an excellent way to record images, especially animations. Generally, film cameras must be set on tripods to shoot images from the monitor screen, whereas video cameras can be linked directly from a computer port.

There are some slide-maker programs and peripheral equipment that work from computer impulses, but they cost around $2,000 and are difficult for most districts to justify. Recent innovations are encouraging, however. The near future should provide lower prices and improved capabilities in image transfer.

Tasks

1. Research the types of computers available in your school and/or district. Make a list of brands, peripherals, K-power.

2. How many computers are "stored" or only used part of the time in your school? How many are microcomputers? What are they currently used for? By whom?

3. Is there a microcomputer available in the teacher's lounge for lesson planning? Grade recording? Learning? Practice? Graphics?

4. What are the attitudes regarding computers? Principal? Secretary? Librarian? Teachers? Students?

5. If there is a computer lab fully scheduled, could you obtain day schedule release time to develop an after school art lab useage? (As in flexible scheduling?)

6. Are color monitors available for art instruction? How many?

7. How many disk drives are available for the computers you might be using for art instruction?

8. Are either printers or plotters available for use solely for art instruction or on a time-share basis?

9. Does your school have telephone lines dedicated to the use of modems among and between classrooms? Within district schools? Among districts in your area? Statewide? Would you be able to network with other art instructors throughout an area, district, or region?

10. What input tools are available to you?

Mouse? Joystick? Touchpads or Graphic Tablets? Paddles?

11. Is photography a part of your art program or can you cooperatively integrate photo instruction with computer output?

12. Does your AV or IT (Instructional Design) Department have cables to connect VCR units to computers for recording? Would they get them for you out of their budgets?

BASIC PROCEDURES FOR THE CLASSROOM CARE OF MICROCOMPUTERS

Once you have one in your very own classroom, it doesn't take too much to keep it happy. While not totally indestructible, computers take a lot of abuse before getting too upset or having a nervous breakdown.

They do not like smoking, food or drinks spilled on them, excessive heat or cold, violence, being dropped on hard surfaces, etc. Keep them separated from any of the dusty arts, especially ceramics work areas, anything with sawdust, plaster dust, erasure crumbs, and the like.

They do like humans, problem-solving, assisting in creating and instructing. They offer speedy everything, from execution of commands, to feedback, to error making.

Turned off, they are nothing but a piece of furniture. As such, they deserve slip covers (and maybe a throw pillow or two). Turned on, they are something else indeed and will "turn on" your students in ways you will be amazed to discover.

All computers come with instructional manuals. Granted, some are much better than others, but they all have purpose for existence. READ before poking buttons.

Follow the instructions for setting up the hardware and getting started on the computer. The better you do your part with the earliest stages, the better the computer will perform for you.

If you have a lot to say about the brand of computer that will become a permanent part of your art classroom or art teaching, consider the quality and ease of use of the "documentation" (READ: "printed materials, manuals," etc.) to be a very important aspect of your selection. Your dealer may be a wonderful salesperson and a nice human being, but you will find, in most cases, that you are very much on your own once you have the machine in the classroom.

Always follow the instructions for startup and shutdown of the particular brand of computer you have. Make a poster of these instructions and other posters for floppy disk care. Put them on wall space above the computer monitor (see list included in section on "Floppy Disks").

Consider the possibility of having students memorize startup and floppy disk care instructions as a prerequisite for computer use.

Appoint monitors to supervise computer use. Base your appointments upon mastery of skills. Rotate monitors based upon proficiency.

Make sure everyone knows to dim the screen when taking a break so that images don't "burn into" the computer monitor.

If your school or district does not have a regular maintenance program for all computers, be certain to read and follow the maintenance instructions for your brand as

printed in the manuals. Design and execute another poster for your office wall or a "special alert" design for your lesson plan book so that you can establish and follow a regular maintenance schedule.

Silk screen or batik some fabric dust covers (slip covers) for your computers. Get in the habit of covering the computers whenever they are not in use and you will increase longevity and decrease downtime for cleaning/repairs.

Floppy disks are not frisbees to be sailed across the room. Nor are mouses to be held by the tail and swung above the head like a cowboy's lariat. Junior scientists love to take the ball bearing out of the bottom of the mouse and somehow have trouble getting it back together right. Keep your teacher eyes alert, especially for these cute tricks.

Unless you use rubber pads (like the ones used under typewriters), the plastic feet on the mouse wear down rather easily under classroom use. A little drilling by a shop colleague will permit super-glue and BB's to be used as replacement feet. These permit extra long-term usefulness.

Consider asking a typing instructor at your high school (or nearby high school) to save old typewriter desk pads for you to cut up and use under mouses.

It is not how HARD you press on the touch-tablet or graphics tablet that makes a mark on the monitor, it is how gently. Encourage your learners to use gentle persuasion with tablet inputs. Especially at first, keep an eye out for someone tempted to use a real pencil or pen, hairclip, housekey, fingernail file, or pocketknife, rather than the stylus.

When you find that your stylus supply disappears over time, begin enjoying dinner out at your nearest oriental restaurant and bring the chopsticks back to the classroom with you. Make sure the drawing end is smoothed with a little fine sandpaper or emory board.

By keeping the stylus supply in an empty coffee mug, students seem to remember to return them at the end of class.

Design, print, and assemble your own floppy disk sleeves/jackets. You might color code them so that different software is easy to recognize and difficult to confuse with save disks or disks students might bring from home.

Purchase commercially available plastic storage boxes for floppy disks and keep them in a clean, safe place.

Floppy Disks

What IS a Floppy Disk???

A floppy disk is a thin wafer of mylar coated with a magnetic substance. The mylar is enclosed in either paper or thick plastic and placed in a paper or thin plastic sleeve or dust jacket.

When the disk is inserted into a disk drive, the floppy may either already contain data or be prepared to receive data for saving. A floppy disk records data in a manner similar to tape recordings in that a head in the disk drive either reads from or writes to the mylar portion of the disk. Information is recorded in concentric circles called tracks, which are further divided electronically into sectors. Sectors record bytes of information and report data saved in "K's".

Floppy disks generally come in three sizes: the almost obsolete 8" disk, the very common 5.25" disk, and the increasingly popular 3.5" micro-floppy. Both the 8" and 5.25" disks are in the paper covers mentioned above, while the 3.5" floppy is sealed in a firm plastic case with a sliding metal cover to protect the mylar.

Some school districts purchase "generic" floppies in gigantic quantities to economize. Others buy specific brand name disks of known quality and reputation. The average life expectancy of a 5.25" floppy disk is 40 working (use) hours. This is a very long time.

When at a store that sells computer floppy disks, observe the many brands and the designations: SS for single-sided, DS for double-sided, SD for single-density, and DD for double-density (density = thickness). Also observe at your friendly store a little gadget called a disk punch. If you purchase 5.25" single-sided, double-density disks, you can use the disk punch to put a notch in the left side to match the notch on the right side of the floppy, thereby creating a double-sided disk. Most people who use the soft floppies take advantage of the savings inherent in this practice and have no trouble with data storage or retrieval. Yes, this is legal to do.

What are the risks? In some instances (and with cheap disks), data might "leak through" from the back side to a front side causing the computer to not be able to read the disk to LOAD from it (retrieve data thought to be saved). Experiment. Decide for yourself. (Even when using "generic" disks, no data leaks have been noted by this author during four years of doing this, three years of which involve classroom use.)

The same principle applies to the 3.5" floppies. A good rule of thumb is: if your computer will format (initialize) both sides of the disk, tell it to do so. If it doesn't, you don't have the option.

What are floppy disks good for?

Initially, a floppy disk was necessary to get the computer going. The first thing a micro did when turned on was to look for a disk to tell it what to do next.

A floppy disk is either blank or has something on it. If it has something on it, the something is either software or "SAVES".

Software can be divided into two elementary categories.

One kind is a "utility" or "systems" disk. Either of these designations implies a programmed disk that assists the user to do chores or to get into a programming language so that the computer can be manipulated by the user without employing any other software. People who are interested in BASIC, or other programming languages, generally get their DOS computers started with utility disks.

Next, floppy disks can contain programs that have already been designed by programming experts and produced to assist users in doing specific tasks. For art teachers, such tasks might include drawing and painting programs, printing programs, art history and appreciation programs, animation programs, and the like. Disks with programs already on them fall into the category of SOFTWARE. Software is generally selected and purchased by individuals to help them do the tasks they

want to do on computers without having to learn or do any computer programming.

Lastly, floppies are good for saving and retrieving work accomplished through either programming or using available software packages. It is not wise to save pictures or text on software disks. Many software packages are "write protected" to prohibit saves to the master disk. Others should be so protected. In classroom use, master disks should probably be fastened into a coat of armor to protect them from student "saves".

Write Protection. What is it?

When 5.25" floppy disks are first purchased, they frequently come with extra labels and a sheet of press-on tabs. The labels should be attached to the disks and identified as to what's on there. The tabs are to be used to protect disks that should not be used for recording. Tabs bend over the notches on the right and/or left sides of disks. When they are in place, the computer will refuse to SAVE (write) anything new on them.

Some software comes with permission to make one "backup copy". After the copy is made, both the original and the copy should immediatety be "write protected" so that they are not accidentally destroyed.

The 3.5" micro-floppy disks come with a notch in the upper right hand corner. This notch is moved to lock or unlock (write protect).

Proper care of floppies:

1. Handle the disk only by the jacket and/or

label. Never touch the disk cover nor the exposed plastic area.

2. When not in use, keep the disk stored in its protective jacket or carrying case.

3. Keep the disk away from magnetic fields such as the top of the disk drive and the top of the computer. Keep it away from telephones, electric typewriters, radios, TV tops, magnets, vehicle ignition systems, and nuclear power plants.

4. Store disks upright in the jacket, preferably in a plastic box, away from direct sunlight, moisture, and extreme heat or cold. Especially keep them out of car trunks, back seats, glove compartments, etc., on hot summer days or very cold winter ones.

5. Handle disks gently. Don't bend, fold, or mutilate them. Don't use paper clips or force disks into or out of a disk drive.

6. Use a felt tip pen to gently write on any label already attached to a disk. Avoid using a ball point pen or lead pencils. Never press hard when writing, even with a felt marker.

7. Never use an eraser near nor on the floppies. The dust droppings can get onto the mylar and into the disk drive causing no end of trouble. Dust and dirt of any sort can seriously damage not only the disk but also the disk drive head.

8. Never insert or remove a disk when the disk drive's red light is on nor when the drive is running.

9. FREQUENTLY make "back-up" disks (extra copies) of your work. Store disks in a safe location to prevent loss of data.

Tasks

1. Have your students select one or more of the above notions to illustrate using the computer software of choice.

2. Make several posters to be placed above monitors listing floppy care advice.

3. Prepare a special shelf area for books, periodicals, software, and other important materials related specifically to computers and their proper use.

4. Check with proper school personnel to inquire about the purchase of floppy disks for art use.

5. Check with media specialists, such as librarians or AV instructional technologists, to learn if microcomputer software and other supportive materials are available on a check-out basis.

6. Visit local microcomputer dealers for demonstrations of drawing, painting, and graphic arts programs on various brands of computers.

SOFTWARE

Given a simple-to-use program with an adequate instructional manual (such as Mousepaint or KoalaPaint) and four hours at an Apple//e with either a mouse or touch tablet, and most adults will not only master that program, but establish a firm base for getting into any other graphics program on the market. Given another four hours and these same adults will do something that is creative, artful, and begins to push the boundaries of that program on that computer. Given still another four hours and there would be total readiness for the next level of difficulty.

While there are some software manuals that can drive a sane person close to homicide, most are written in a clear, straightforward manner. They generally assume a working knowledge of the computer and procedural knowledge regarding disks and other accessories (mouse, joystick, tablets, etc.) but once the pages begin to turn, it is more and more a matter of additive learning and transfer of training than total newness. For many of us, it gets to be an exciting challenge to see how quickly we can get the next new learnings into our heads so that the mere mechanics of operating our computer are on automatic pilot and the fullness of our concentration is on the art problem to be solved.

As software programs increase in complexity, the initial time invested in the achievement of control and mastery also in-

creases. For example, to learn the Blazing Paddles drawing program might take four to six hours for mastery (reduce to less than two hours if you already know Mousepaint or KoalaPaint), but to work into Take One or Movie Maker (comparable animation programs), might take as much as eight to twelve hours. Fantavision (a more complex animation package), which some friendly high school students seemed to grasp very well within 15 hours of self-tutoring, boggles adults for longer learning periods. The teenagers jumped in and worked consecutive days and generous times (1-3 hours) each day. One student took the software home overnight (the teacher's personal copy and with permission, of course), used it on the compatible family computer, and came in the next morning with several good animations.

Learning to use software is exponential. Each new learning experience builds upon prior learnings and success.

It has been observed that people who have mental blocks about learning the simplest of programs also increase the blockage exponentially when approached with more complexity.

Most simple software (for computers 128K or less) can be individually learned merely by spending quality time with the program and the instructional manual. This does imply that you do already know how to operate the computer.

The best attitude for learning is to take time to "play" with the process and to try your best to enjoy it. Many learners (especially high achieving adult types) think they should be very serious about computer learnings and should catch on much faster than they really do. Frustration levels rise and anger

comes along quickly. If this should ever happen to you, breathe deeply, relax, and go back to trying to have some fun with the learning.

Once you feel comfortable with the basics and with one computer, you will find it much, much easier to take on another model of the same brand of computer, or another brand of computer, and the software that works on it. This is when you will begin to feel quite smart about the learnings you are acquiring. If so, you deserve it. Enjoy. You have arrived at where the technology is beginning to work for you rather than the reverse. Once you reach this point, the best is yet to come.

What are some software packages for art?

New or upgraded versions of software are being produced each month. The list that follows is but an example of some titles available just for art instruction, applications for vocabulary building, and production. Still other programs are available for history and art appreciation.

In this list, the programs appear in recommended grade level categories, **followed by** a number, in parentheses, indicating:

1. Drawing/Illustration/Painting
2. General graphics/Layout/Design
3. Newsletter design and layout/ Fonts
4. Animation

While grade level is used here, it would be better to consider that many beginners at computer art would profit from learning with a simple program (intermediate level)

and working into more complex applications. Adults can achieve good work with programs that more gently introduce them to computer processes. Too, some beginners advance rapidly and might profit more from what seem to be programs designed for teen or young adult learners. OR: take these categorical recommendations and interpret them very broadly!

K-Primary Grades

Create With Garfield (1)
Color Me (1)
The Talking Coloring Book (1)

K through Intermediate Grades

Mask Parade (1)
Mr. Pixel's Cartoon Kit (1)
Mr. & Mrs. Potato Head (1)
Rainbow Painter (1)

Intermediate Grades

Accolade's Comics (2)
Blazing Paddles (1)
Delta Drawing (1)
Greeting Card Maker (2)

Intermediate through Junior High

Aegis Animator (4)
Art Studio (1)
CoCo Max (1)
D.E.G.A.S. (1)
D.E.G.A.S. Elite (1)
Digital Paintbrush (1)
Dr. Halo II (1)
816 Paint (1)
Fontasy (2)
GraphicCraft (1)
KoalaPaint (1)
LabelMaster Elite (2)
Minipix Disks (1)
Mousepaint (1)
Newsroom (3)
PC Paint Plus (1)

Paintworks (1)
Prince (printer utility)
Principal's Assistant (2)
Printing Press (3)
Sign Designer (2)
Sign Plot (2)
Walt Disney Card & Party Shop (2)
Disney Comic Strip Maker (1, 2)

Intermediate through Senior High

Dazzle Draw (1)
Comic Works (1, 2)
DeluxePaint (1)

Junior High Grades

Animate (4)
Award Maker (2)
Certificate Maker (2)
EGA Paint 2005 (1)
Dr. Halo DPE (1)
Movie Maker (4)
NewsMaster (3)
PartyWare (2)
PIXIT (1)
Printshop (2)
Printmaster Plus (2)
Sign Designer (2)
Take One (4)

Junior through Senior High Grades

CAD 1 (1)
CAD Master (1)
Comic Works (1, 2)
Fantavision (4)
Graphic Works (2)
MacPaint (1)
MacBillboard (2)
MacDraw (1)
MacVision (1)
Publisher's Paintbrush (1, 4)
Silicon Press (2)
Superpaint (1)
T-Shirt Shop (2)

Senior High Grades

VideoWorks (4)
Easy 3-D (1)
Pro 3-D (1)
Cricket Draw (1)
PageMaker (3)
Adobe Illustrator (1)

What is the best way to buy software?

Before buying software, it would be wonderful to have a friend, colleague, or software dealer who would give you a demonstration of the programs you are considering. Better yet, you should work through a tutorial or spend some time learning the software yourself before buying or recommending for purchase.

Software is available through mail order catalogs, dealerships, and discount stores. There are stores that specialize solely in software, liquidation stores, and software users clubs, where software is sometimes swapped.

Frequently, by dealing directly with the home offices of the software companies, schools can receive special discounts for quantity orders. Your district budget officer or head of the business department might already have many catalogs of available software listed by dealer. Although this person may not yet know much about software for art instruction, computers have been in most schools long enough for most business persons to have valuable insights into purchasing for them.

As with most else in life, it pays to shop around and to ask many questions about the software you are purchasing.

What are some of the questions one should ask about software?

1. Will it work on our computer? One of the first things you may notice if you visit a software store or section of a store is that some titles appear with many different computer brand names, while others appear for only one computer type and brand. You must read carefully so that you purchase software that has been designed and prepared for the kinds of computers you have.

2. Will it work with the input tools we have? Check all descriptions to see if the program works with your mouse, joystick, touch tablet, lite pen, or whatever input tools the school has.

3. Will it print out on the printer we have attached to our computer? Most packages list the printers with which they will work.

4. Can I make BACKUP COPIES? Can I make copies from the original? If yes, how many? Usually you have to learn this from the reviews you read or after opening the first package. If you are working with a software dealer, you may be able to ask directly.

5. Can I use the program on many machines at the same time without trading back and forth once the program is loaded? OR: How many copies will I have to buy in order to use this software with the number of computers I have in my classroom or computer lab?

6. Is there a warranty? If yes, how long is it applicable? If I ruin my original, how long does it take to get a replacement copy? What will it cost?

7. Will the district "register" the software

and support the purchase of replacement copies?

8. Can the library or media center buy copies to be shared by many teachers in the school on a checkout policy?

How much does software cost?

Prices of software not only vary from dealer to dealer, but also from package to package or even depending on the type of computer. On a given day, I saw a mail order price of $45, a dealer price of $68, and a discount store price of $39 for one software program. A less complex program to write should be less expensive (Color Me is $30, Dazzle Draw is around $50). The price for Blazing Paddles for the Commodore is only $35, but for the Apple it is $50. On the above list for the different brands, prices range from a low of $35 to a high of $1,195.

How long does it last?

If you take good care of your program disks in both use and storage, they will last a very long time. Real research needs to be done to better test classroom performance, but one of the best rules of thumb found so far is that an average 5.25" floppy disk has a 40-hour running life. Since most of the above programs are loaded and run on a half-minute basis, a given disk should last 288,000 uses. A minute loading time would permit 144,000 uses. A program that intermittently runs the disk might only last 100,000 uses or 50,000 uses. Assuming seven art classes a day, five days a week, using the one program exclusively for 36 weeks on a base of 50,000 uses, such a program disk could last about 39 years.

Human nature being what it is, an educated guess should give us one to five years of pretty rough classroom use per 5.25" floppy disk. The 3.5" disks are much more durable than the 5.25" disks.

Tasks

1. What software is already available for art instruction in your school/district?

2. Is available software already owned by persons with vested and unsharing interest, or is it possible for you to use it to (a) learn; (b) teach?

3. How do you obtain your very own software for teaching? Library or AV checkout? Budget item with a computer expenditure group? Art budget? (ouch!)

TRAINING

How does a very busy person find time to learn about computers for art teaching situations?

The honest answer to finding time for computer learning is that there just isn't enough in most teaching days. Most art teachers don't have the time to invest.

Working from that premise, it will only be with great difficulty that art teachers somehow manage to exert time from their already hassled schedules. There are no easy solutions to the problem of time.

Some options:

1. In-service, hands-on computer basics (how to turn it on, do simple word processing, save to disk, retrieve from disk, use

input tools such as mouse, touch tablet, printers, etc.) might be provided by:

1.1. School district in-service sessions;
1.2. Colleagues at professional education and art education associations at conferences;
1.3. Computer vendors;
1.4. Members of computer art/graphics clubs;
1.5. Consultants;
1.6. Professors at community colleges or universities;
1.7. Self.

Many SCHOOL DISTRICTS have lab situations and computer coordinators who might be most helpful in getting art teachers started with computers. Using graphics software and manuals, most art teachers can work from the basic training into art software exploration and art production. Most computer generalists do not have information regarding art related software. Many districts do not have color monitors and/or color printers.

Computer workshops at local, state and national ART EDUCATION CONFERENCES have not been well-attended in the past. Contact appropriate officers and board members requesting such sessions.

Many computer VENDORS will make arrangements for hands-on demonstrations and/or experiences for conference-sized groups or for schools where computer labs are available. On rare but possible occasions, the salespersons at computer stores will have some grasp of graphics production using various computers. This is risky and may cause more problems than provide solutions, but it might be worth the try if you are getting desperate.

Check in your local telephone book or newspaper, or write to the major computer manufacturers to learn if there are COMPUTER CLUBS in your town. Generally, people cluster by computer brand i.e., Apple clubs, Commodore clubs, Atari clubs, etc.

Make proper inquiries at your school/district to see if your administration can afford to bring in a CONSULTANT to demonstrate graphics software and production for a local meeting of art teachers. The roughest part is finding a consultant, next is finding the lab space and time, next is getting the art teachers to show up.

If you live near a COMMUNITY COLLEGE OR UNIVERSITY, make inquiries regarding the ability of the art or art education faculty to provide training in microcomputer art production and, hopefully, curriculum development using computers in art education.

Lastly, go out and buy a computer, sit down with the books, and WORK your way into it. It is not the greatest way to learn about microcomputers, but it is not as awful as many people think it might be.

EPILOGUE

I have this visual image of my mother as an elementary student ciphering on a piece of slate in her one-room schoolhouse just after the beginning of the 20th Century. Thirty some years later, I am sitting in a classroom with my rather newly invented ball point pen smudging out my arithmetic solutions on relatively inexpensive, ruled tablets. My mother's grandchlidren used felt markers and pocket calculators with one eye on the TV and the other on their modern math problems. My mother's great-grandchildren are doing advanced calculations on laptop or microcomputers in today's schools.

Just as the slate was cleaned in 1915 to permit penmanship lessons, drawings, spelling exercises, creative writing, and the like, the micro and lap computers of today and tomorrow can also be used for a significantly broad range of activities. Several major differences come readily to mind, however. If the learner does something of value on a computer, it can be "saved" as a permanent record for however long the individual wishes. (The inherent potential for longitudinal research is absolutely mind-boggling!)

If a learner is linked to a resource (library, larger computer, network, etc.), background data relevant to the project or assignment at hand can be retrieved by means of a modem connection.

The learner can be "tutored" by networking the lap or microcomputer with other microcomputers, or by uploading and downloading with a maxi- or minicomputer. Learners can have instant feedback, enrichment and enhancement of a particular learning experience by these same means.

The student of today has knowledge, resources, and responsibilities many times that of humans at the turn of the century. Contemporary "school slates" provide the power and capabilities to help make sense of the extremely complex content of our planet and universe as well as survival of daily life. For better or worse, it is reality that our schools are increasingly acquiring microcomputers for classrooms. For many years, the potential importance of these tools for art instruction seemed minimal and inadequate. The time is upon us, however, to take heed of the available technology and to make wise judgments about the possible art education interface. Educating our professional selves will cost in terms of time, energy, and commitment. It should prove to be worth the price to us as teachers, however, because the world of our youth requires them to be equipped with tools to match their times.

If we expect the art classroom computer learnings to be qualitative, it is up to us, as professionals, to learn, develop, test, research, and revise this technical arena as needed in order to provide learners with sensible applications.

As this century turns into the next and new generations continue the human endeavor, it will have behooved us to have made these early marks on our cave walls.

Dr. Ginny Brouch is president of Palo Verde Research Associates, teaches computer design and graphics part-time at Phoenix Community College, and generally enjoys life in the southwest desert country of Arizona.

Communicate, if you would like. PVRA is at P.O. Box 82187, Phoenix, AZ 85071.

REFERENCES

This section should include books and periodicals relevant to establishing a beginning awareness of microcomputer information. Because new materials are appearing at a rapid rate, it seems a better idea to refer interested readers to libraries, book stores, and magazine racks in commercial places.

Books are available for brand name computers for beginners, intermediates, and advanced users. Periodicals are also available for individuals, families, home interests, users of a wide range of software, and also by computer brand name and, frequently, model.

A visit to the magazine and book racks of local stores will provide an array of interesting reading material for whatever level an art teacher may be. Most public libraries and many school libraries also have ample coverage of books and periodicals for persons interested in computer learnings. Some even have computers and software available for work in special study areas.